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Slaves as burial gifts in Viking Age Norway? Evidence from stable isotope and ancient DNA analyses

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ABSTRACT

Ten Viking Age individuals from the northern Norwegian site at Flakstad were analysed for $\delta^{13}C$, $\delta^{15}N$ and ancient mitochondrial DNA fragments. The material derives from both single and multiple burials with individuals treated in different ways. The genetic analyses show that the individuals buried together were unlikely to be maternally related, and stable isotope analyses suggest different strata of society. It is, therefore, suggested that slaves may have been offered as grave gifts at Flakstad. A comparison with the remaining population from single graves shows that the presumed slaves had a diet similar to that of the common population, whereas the high status individuals in multiple graves had a diet different from both slaves and the common population. The results provide an insight into the subsistence of different social groups in a Viking Age society, exposing unexpected patterns of living conditions and food distribution.

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1. Introduction

The Viking Age (A.D. 800–1030) was characterized by striking heterogeneity in burial customs, with regard to burial form, grave artefacts and treatment of the body. Among these, instances where two or more individuals were buried together stand out as a unique possibility to study social relations in the past. Graves with two or more individuals occur quite frequently throughout the Viking Age and all over the Viking World. The choice to bury persons together is hardly coincidental, but rather a deliberate action based on specific relationships between individuals. These relationships could be egalitarian, reflecting family members or persons otherwise closely connected. Alternatively the choice could involve human sacrifice or in other ways persons of different social rank, where one or more persons are intended to accompany the "main" burial. In Norway, few skeletons from inhumation burials remain due to poor preservation conditions, and thus indications of social relations, based on body treatment and artefact distribution, are often absent.

On the northern Norwegian Island of Flakstad a Late Iron Age (A.D. 550–1030) burial ground was located and partly excavated in the period 1980–1983. Human remains from ten individuals in three single burials, two double and one triple burial, were dated to the Viking Age (The Schreiner Collection Database, 2013; Sandmo, 1985a). Although much of the contextual information has been lost due to farming activity, the burials showed unusual features. In each of the double/triple burials one individual was buried intact, while only post-cranial bones were found from the remaining individuals. The burial form at Flakstad may indicate graves containing master and slave, as crania from four individuals were absent from the graves. This interpretation is supported by a number of double burials found within Norse societies indicating slaves buried with their masters (Andersen, 1960; Hemmendorff, 1984; Holck, 1997; Holmquist Olausson, 1990; Ramskou, 1965; Skre, 1998; Zachrisson, 2003). The presumed presence of slaves is based on a number of factors such as maltreatment of the body, decapitation, binding of hands and feet and uneven distribution of grave gifts. At Flakstad the four accompanying individuals were seemingly decapitated, and thus the burials immediately appear to fit this pattern. However, as knowledge of the burial context from Flakstad is limited, the material calls for further investigation to study the social relations represented. Through application of stable isotope and ancient DNA (aDNA) analyses the presented

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investigation aims at identifying dietary and genetic patterns that may highlight social relations reflected in differential treatment of the dead.

2. Material and methods

The burial site of Flakstad is situated on Flakstad Island, part of the Lofoten archipelago in northwestern Norway in Nordland County (Fig. 1). The burial site is situated close to a settlement area, which exhibits traces of contemporary agrarian activity. Parts of the burial site at Flakstad vicarage were excavated in the period 1980–1983 (Sandmo, 1985a,b). The ten individuals presented in this paper were all dated to the Viking Age based on burial artefacts. Graves 5858, 5860 and 5861 are single burials, and were excavated and documented by archaeologists. Burial artefacts consisted of weapons, comb, beads, garment accessories and animal bones, representing different levels of social wealth (Sandmo, 1985b). Graves 5863 and 5865 were registered as double burials (The Schreiner Collection Database, 2013). In grave 5864 a third individual was identified, but the remains are so fragmented that absence of the skull may be due to a general problem of preservation.

The skeletons in double/triple graves were buried in shallow graves close to the surface, and were partly disturbed by agricultural activity before archaeologists arrived. The disturbance was mainly due to the ongoing activity at the site, but earlier disturbance cannot be ruled out. Thus, the interpretation of multiple burials was questioned (Sandmo, 1985b). Information on burial context is, therefore, poor and fragmented, and few burial artefacts were recovered from the double graves; two knifes, a horse bit, a bead of amber, animal bones, parts of a whetstone and iron fragments. Unfortunately no information on artefact distribution within these burials exists. The skeletons were found in clusters, with an interval of approximately 30 m between each cluster. Each double/triple grave contained only one skull, but postcranial remains from two or three individuals. It seems unlikely that the missing skulls would be lost by coincidence in all four cases. In the osteological report no signs of decapitation were mentioned (Holck, 1983), although lack of evidence cannot serve as a strong argument. It should be noted that the heads might also have been removed post mortem. To ensure that cranial and postcranial material matched in the double/triple graves, samples from both long bones and mandible were taken in addition to teeth.

2.1. Stable isotopes

Food consumption is reflected in the isotopic composition of human tissue. Stable carbon and nitrogen isotope ratios are expressed as isotope values, $\delta^{13}C$ and $\delta^{15}N$, and reported relative to the standard PDB limestone for carbon and AIR atmospheric N_2 for nitrogen. Carbon isotopes fractionate differently depending on the photosynthetic pathway, but also differ between marine and terrestrial environments (Chisholm et al., 1982). Since only the C_3 pathway is relevant in an Arctic context, $\delta^{13}C$ is here analysed to distinguish between terrestrial and marine food sources. Nitrogen

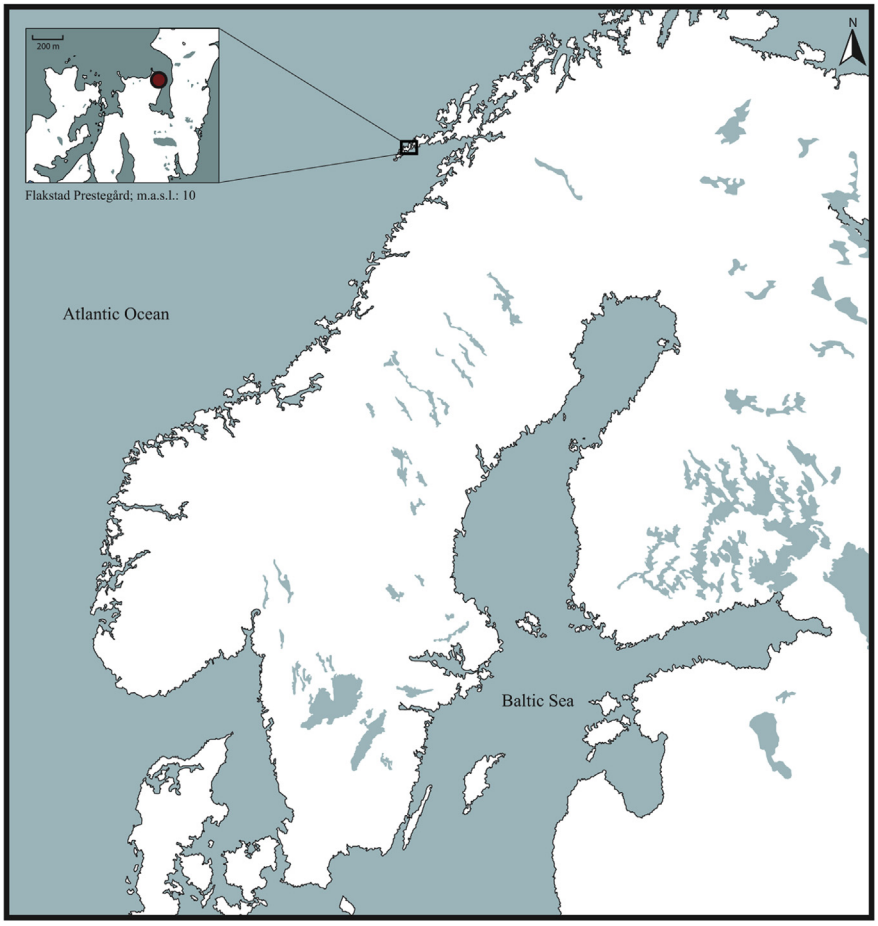

Fig. 1. Flakstad, situated in Nordland County.

isotopes fractionate for each step in the food chain (Minagawa and Wada, 1984), and the $\delta^{15}N$ value therefore indicates trophic level. The $\delta^{13}C$ and $\delta^{15}N$ values in bone and dentine collagen mainly reflect the protein intake (Ambrose and Norr, 1993). Isotopic values in teeth reflect the period of tooth formation, and thus the childhood and adolescent years of the individual. Bone tissue, by contrast, remodels throughout life and therefore provides an average isotopic value reflecting the last 5–20 years, depending on various conditions, such as type of bone and age of the individual (Hedges et al., 2007; Sealy et al., 1995). Due to this variation, we have analysed both tooth dentine and bone to assess whether there has been continuity or changes in diet during the lifetime of an individual. Where possible, the cervix of the second molar, reflecting childhood (c. 7.5–10 years of age), was sampled for comparability.

Because of different ecological conditions such as salinity, temperature, distance from land and variations over time, isotopic values must always be considered in relation to the local fauna (Jones et al., 2012). In northern Europe it is often assumed that $\delta^{13}C$ ratios range from approximately −22‰ for a purely land based nutrition to −12‰ for an exclusively marine diet (Chisholm et al., 1982). However, $\delta^{13}C$ values from North Atlantic cod collagen emphasize the complexity of $\delta^{13}C$ values in arctic Norway, as they range from −13‰ to −17‰ for migratory cod (Barrett et al., 2008). Rather than an absolute end-value for a purely marine protein intake, we therefore operate with a predicted $\delta^{13}C$ range for humans consuming an exclusively marine diet in the northern regions of Norway. Available data documenting the $\delta^{13}C$ offset between cod collagen (reference data) and muscle (consumed diet) is limited, though studies performed on modern gadid fish from Scotland showed on average a depletion of 4‰ in muscle tissue compared to collagen (Barrett et al., 2000a,b). Considering a trophic increase of 5‰ in $\delta^{13}C$ values from diet to collagen in humans (Ambrose et al., 1997), we have taken into account a +1‰ trophic-level effect for $\delta^{13}C$ in the estimation of marine consumption.

The $\delta^{15}N$ value increases by 3–5‰ for each trophic level in the food chain, and thus provides a distinction between herbivores and carnivores and between terrestrial and marine organisms, since the food chains are longer in marine environments (Bocherens and Drucker, 2003; Minagawa and Wada, 1984). The $\delta^{15}N$ values of predatory marine mammals represent the highest levels in animals as they are at the top of the food chain. The values may thus range from 6 to 8‰ for a purely vegetarian diet to around 20‰ for a diet based exclusively on seal, as reflected in the analysis of a Greenland Inuit population (Schoeninger et al., 1983). $\delta^{15}N$ values in a consumer's collagen reflect consumed diet plus trophic level, allowing direct interpretation of $\delta^{15}N$-results without offset correction (Ambrose et al., 1997).

Available fauna recovered from the Flakstad graves included specimens of cattle, sheep/goat, horse, dog and whale. All samples for stable isotopes were drilled with a dentist drill after removal of the surface to avoid contamination. Bone and dentine collagen was extracted according to Brown et al. (1988), which includes an ultrafiltration step to remove contaminants and degraded products of molecular sizes <30 kDa. The extracted collagen was freeze-dried and the carbon and nitrogen isotope ratios determined using a Carlo Erba NC2500 analyser connected via a split interface to reduce the gas volume to a Finnigan MAT Delta + mass spectrometer, at the Stable Isotope Laboratory (SIL), Department of Geological Sciences, Stockholm University. The precision was ±0.15‰ or better.

2.2. Ancient DNA

The ancient DNA analyses of the Flakstad human remains targeted mitochondrial DNA (mtDNA). The molecule has multiple copies in human cells and is inherited from mother to child. The properties allow for tracing ancient human migrations and genetic affiliation through the maternal lineage (see Bandelt et al., 2006 for full overview). In order to investigate putative origin and possible maternal relationships among individuals from Flakstad, we have analysed bone samples from all 10 individuals presented here.

General guidelines for work with ancient DNA were followed at all times (Pääbo, 1989; Richards et al., 1995). Apart from an additional UV-radiation step, bone powder samples were prepared following Hagelberg and Clegg (1991). Between 20 and 50 mg of bone powder underwent DNA extraction with Qiagen DNeasy Blood & Tissue Kit (Qiagen) according to a modified manufacturer protocol. MtDNA was amplified between positions 16,050–16,392 in five overlapping fragments as described in Malmström et al. (2009). Obtained DNA amplicons were sequenced twice on a 454 GS FLX platform (Roche, Life Sciences) and synthetic clones underwent statistical analysis in order to identify authentic aDNA sequences for each of the individuals (Helgason et al., 2009, 2007; Malmström et al., 2012). The analyses were performed using PhyloNet v 1.0.0. software (Helgason personal communication, see Malmström et al., 2012).

Haplotype diversity was calculated according to Nei (HD) (Nei, 1987), while within population gene diversity, as well as minimum and maximum match probabilities were estimated as in Brinkmann et al. (1999). In short, the measure was calculated in order to assess the probability of obtaining different haplotypes while sampling two individuals from the same population (dw_{min}); the maximum (mw_{max}) and minimum (mw_{min}) probabilities of obtaining within population match.

3. Results

3.1. Carbon and nitrogen isotope analyses

All samples except the whale specimen provided sufficient collagen yields (1.1–12.0%) for carbon and nitrogen isotope measurement (Tables 2 and 3). All samples fall within the accepted C/N ratio, and carbon and nitrogen concentrations for samples of no diagenetic alteration (DeNiro, 1985; Ambrose, 1990).

The $\delta^{13}C$ values for humans range from −19.5‰ to −15.3‰ (−16.8 ± 0.9‰, mean ± s.d.), and the $\delta^{15}N$ values range from 10.8 to 17.7‰ (15.7 ± 1.6‰, mean ± s.d.) and clearly indicate a strong differentiation between individuals (Table 3). This range is significantly larger than what would be expected from a population consuming a homogeneous diet (Lovell et al., 1986), and identifies different sources of protein intake.

For individuals 5863A, 5864A and 5865A, all buried intact in double/triple burials, samples from mandibles served to control the osteologist's match between crania and postcranial remains (Table 3). All mandible samples have higher $\delta^{15}N$ values than those

Table 1
MtDNA HVR1 sequence matching probabilities within ancient Flakstad, Iceland, Denmark, England and modern Norway. Comparative data was collected from the following publications: Denmark (Dissing et al., 2007; Melchior et al., 2008; Rudbeck et al., 2005), Iceland (Helgason et al., 2009), England (Töpf et al., 2006) and Norway (Helgason et al., 2001; Krzewińska unpublished manuscript; Opdal et al., 1998; Passarino et al., 2002).

	Flakstad	Iceland	Denmark	England	Modern Norway
N	9	73	21	48	1122
HD	0.92	0.95	0.98	0.99	0.94
dw_{min}	0.81	0.93	0.93	0.97	0.94
mw_{max}	0.18	0.07	0.07	0.03	0.06
mw_{min}	0.08	0.05	0.02	0.01	0.06

Table 2
Faunal stable isotope data from Flakstad.

Species	Sample	% Coll.	$\delta^{13}C$ (‰)	$\delta^{15}N$ (‰)	%C	%N	C/N
Whale	–	0.3	–	–	–	–	–
Horse	Scapula	5.6	−22.3	4.9	38.5	14.0	3.2
	Vertebra	5.4	−22.8	4.9	36.8	13.4	3.2
Dog	M2	11.1	−14.2	18.1	40.1	14.9	3.1
	Femur	11.1	−15.2	15.6	40.0	15.0	3.1
Sheep/Goat	Femur	12.0	−21.6	3.7	39.1	14.6	3.1
Sheep	Vertebra	2.9	−22.3	3.6	37.9	14.0	3.1
Bovine	Femur	2.0	−22.5	4.8	36.9	13.6	3.2
	Astragalus	2.6	−22.4	5.3	38.9	14.0	3.2

from both teeth and long bone from the corresponding individual, but closer to long bone. This could imply that mandibles represent a shorter timespan, as an increase in $\delta^{15}N$ values is observed also between tooth and bone values. For both individuals 5864A and 5865A the $\delta^{13}C$ values from mandibles were close to the long bone values (deviation at 0.0 and 0.5‰ respectively), while the $\delta^{13}C$ values from mandible and femur for 5863A differed by 1.0‰. Considering the distinctly higher bone $\delta^{13}C$ value from individual 5863B in the same grave, it was still assumed that the left femur sample from 5863A matches the tooth and mandible samples, and that the difference represents a minor shift in diet during the years prior to death. It was thus concluded that all three individuals were likely to be correctly matched with crania and postcranial remains.

Seven out of the ten individuals in the present study have $\delta^{13}C$ values consistently exceeding −17.5‰, and $\delta^{15}N$ values >14.2‰, indicating a substantial intake of marine foodstuffs, although variation between these individuals still indicate variable food sources (Figs. 2 and 3). The remaining three individuals were all deposited in double/triple burials, with their heads intact. Two of those, Individuals 5863A and 5864A, display $\delta^{13}C$ values between −19.5 and −18.5‰ ($\delta^{15}N$ 10.8–13.7‰) throughout life, indicating diets with predominantly terrestrial protein sources, and only some input of marine protein. The third, Individual 5865A, has similar $\delta^{13}C$ and $\delta^{15}N$ values from the tooth sample, representing childhood, but a significant isotopic increase of >1.5‰ for $\delta^{13}C$ and >2‰ for $\delta^{15}N$ from the bone samples, representing adulthood, demonstrating a pronounced dietary shift involving increased marine protein intake during the course of life (cf. Eriksson and Lidén, 2013). Such a radical dietary shift is not evident in any of the other analysed individuals with life-history data (Fig. 2). Intra-individual data from Individuals 5861 and 5864A display very limited variation, 0.0–0.2‰ in $\delta^{13}C$ and 0.2–0.8‰ in $\delta^{15}N$, implying that the overall diet has remained more or less the same during the formation period covered by the analysed elements. For individuals 5858, 5860 and 5863A, intra-individual variation was somewhat larger, 0.5–1.2‰ in $\delta^{13}C$ and 1.0–2.0‰ in $\delta^{15}N$, in each case with values increasing with age, clearly indicating a higher marine protein intake. As the teeth investigated here are second and third molars, one might assume that the possibility of a trophic-level effect caused by breastfeeding is minimal. Thus, a change towards a more marine-based diet later in life is evident for four of the six individuals with life-history data (Fig. 2).

Faunal data from Flakstad include only domesticated species, with $\delta^{13}C$ values for cattle, sheep/goat and horse ranging from −22.8 to −21.6‰, and $\delta^{15}N$ values from 3.6 to 5.3‰ (Table 2). In addition to these terrestrial herbivores, there are also two samples from a dog with distinctly different isotopic values, −15.2

Table 3
Flakstad samples and results. A.No = Anthropological numbers from the Schreiner Collection, Anatomical Institute, University of Oslo. Osteological specifications after Holck (1983). MtDNA motif' lists nucleotide changes detected against revised Cambridge Reference Sequence (rCRS)(Anderson et al., 1981; Andrews et al., 1999). 'Estimated Hg' represents most probable haplogroup assignment while asterisks denote broad haplogroup assignments, which could not be narrowed down to subgroup level. Bone samples listed in italics were used for ancient DNA analyses. ND – not determined. *In individual name denotes the remains with absent crania.

A.No	Sex	Age	Sample	% Coll.	$\delta^{13}C$ (‰)	$\delta^{15}N$ (‰)	%C	%N	C/N	MtDNA motif	Est. Hg
5858	F	20–25	M3	3.2	−16.6	16.7	43.0	14.5	3.4	16162G	H1a
			Rib	8.0	−15.4	17.7	44.3	15.5	3.3		
5860	F	40–45	M2	6.4	−17.4	14.3	44.1	15.2	3.4	ND	ND
			L. Bone	1.1	−16.9	15.9	43.3	15.0	3.4		
5861	M	35–45	M2	5.7	−16.3	16.1	44.6	16.1	3.2	rCRS	H*
			L. Bone	9.1	−16.5	16.3	44.5	15.2	3.4		
5863A	F	40–45	M3	6.8	−19.2	10.8	45.5	15.6	3.4	16069T	J*
			Mandible	3.5	−18.5	12.8	39.4	12.9	3.6	16126C	
			L. Bone	3.7	−19.5	12.4	41.6	15.4	3.1	16184T	
5863B*	M	20–25	*Femur*	7.8	−15.3	17.6	44.8	15.6	3.3	16153A 16189C 16304C	H*
5864A	M	45–50	M2	3.9	−18.9	12.9	43.1	14.7	3.4	rCRS	H*
			Mandible	5.0	−18.9	13.7	39.3	14.5	3.2		
			Femur sin	3.8	−18.9	13.3	44.9	15.5	3.4		
5864B*	M	20–35	*Femur sin*	4.6	−15.4	17.7	44.1	15.3	3.4	rCRS	H*
5864C*	?	?	*Femur*	4.0	−16.2	16.7	44.8	15.6	3.3	16134T 16240G 16286A 16356C	U4
5865A	M	25–30	M2	7.1	−18.7	12.8	44.3	15.5	3.3	16069T	J1b1
			Mandible	6.9	−16.8	15.4	40.3	14.5	3.2	16126C	
			Tibia	9.7	−17.3	14.5	42.6	14.9	3.3	16145A 16172C 16192T 16222T 16261T	
5865B*	F	25–30?	*Femur dx*	8.7	−17.1	14.7	44.3	15.5	3.3	16192T 16256T 16270T 16291T 16325C	U5a

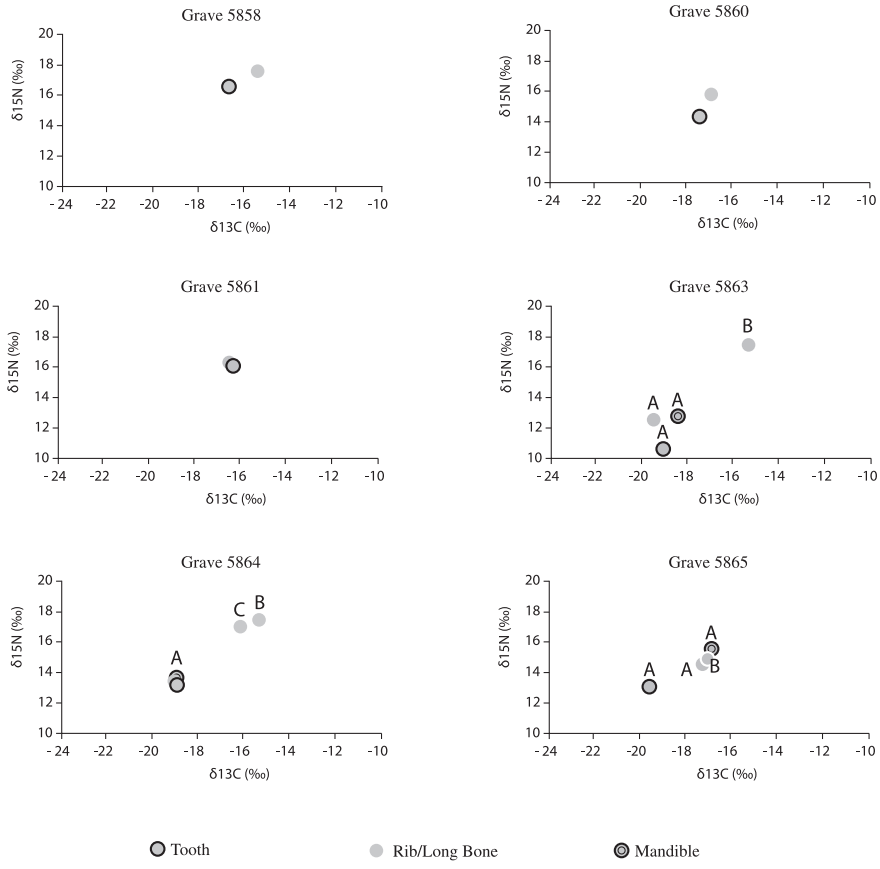

Fig. 2. $\delta^{13}C$ and $\delta^{15}N$ values from teeth and bone for each individual at Flakstad. Individuals marked with "B" and "C" are all persons buried without a head in a multiple burial.

and −14.3‰ in $\delta^{13}C$, and 15.6 and 18.1‰ in $\delta^{15}N$, indicating a heavy reliance on marine resources. The most elevated $\delta^{15}N$ value is from a tooth, and could indicate that the pup was suckled during formation of the tooth. Although the $\delta^{13}C$ value from bone is largely comparable to that of Individuals 5858, 5863B and 5864B, the $\delta^{15}N$ value is considerably lower, 15.6‰ as compared to 17.6–17.7‰ for the humans. This suggests that the dog was fed marine foodstuffs of lower trophic level than those consumed by people.

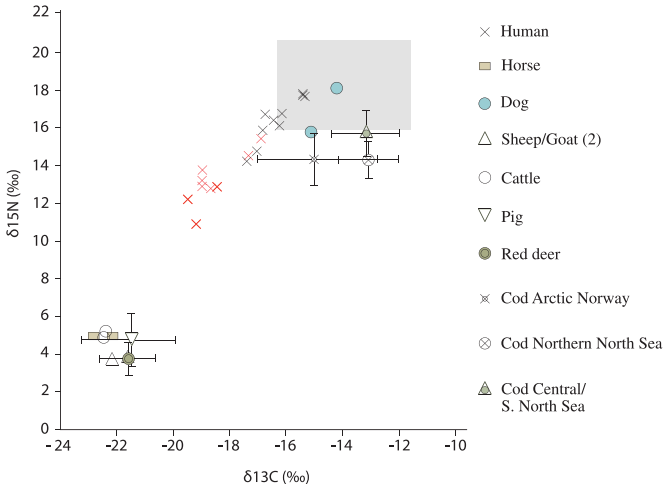

Fig. 3. All $\delta^{13}C$ and $\delta^{15}N$ values for humans and animals from Flakstad, as well as mean faunal data with error bars representing ±2s.d. (data from this study, North Atlantic cod presented in Barrett et al., 2008:856, pig and reindeer from Norway presented in Rosvold et al., 2010:1115). The predicted isotope range for consumers of cod from Arctic Norway are marked by the shaded square (+1‰ for $\delta^{13}C$ and +3–5‰ for $\delta^{15}N$ relative to the food source). Values from humans buried intact in multiple burials are marked with a red cross. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

The mean ±2s.d. of $\delta^{13}C$ and $\delta^{15}N$ values for medieval cod from Arctic Norway (Barrett et al., 2008) were used to calculate a predicted isotopic range for someone on a diet composed exclusively of cod, including a trophic-level offset of +1‰ for $\delta^{13}C$ and 3–5‰ for $\delta^{15}N$ (Fig. 3). The cod data most likely include both coastal and migratory cod – food sources which must have been available to people living at Flakstad. Six samples, from five human individuals and one dog, fall within the predicted range, suggesting a heavy reliance on marine resources. The human samples derive from either single burials, or from the decapitated individuals in multiple burials. A correspondingly high input of marine foodstuffs is also recorded in stable isotope investigations of other Norse societies (Arneborg et al., 1999; Barrett et al., 2000a,b; Barrett and Richards, 2004; Linderholm et al., 2008) and is further supported by the increasing amounts of archaeological remains from marine species in the Viking Age and following period (Barrett et al., 1999; Milner et al., 2007; Perdikaris, 1999).

Individuals buried intact in multiple burials were compared with the remaining individuals using a two-tailed *t*-test with unequal variance. A statistically significant difference ($P \leq 0.05$) was shown between the two groups, both in $\delta^{13}C$ and $\delta^{15}N$ values ($P = 0.046$ and $P = 0.011$ respectively). Only bone samples were used in calculation to ensure that each individual was represented. A comparison between individuals without heads in multiple burials and those buried in single burials showed no statistically significant difference.

3.2. Mitochondrial DNA

Ancient DNA analysis was undertaken in order to investigate probable maternal kinship between the individuals, as well as to establish genetic origins of people. Reproducible mitochondrial DNA sequences were obtained for 9 out of 10 individuals. Sequences from individuals 5858 and 5861 should be treated with caution as *P*-values from c-statistic analyses (Helgason et al., 2007) were too high to confirm 'authenticity'. However, the low number of divergent DNA sequences among amplicons, in combination with good bone preservation, could result in less distinct deamination patterns and reduced c-statistic values. Therefore, we include the sequences from individuals 5858 and 5861 in our discussion.

Only three major European mtDNA haplogroups (lineages) were detected among the individuals: Hg H*, Hg J* and Hg U*; reflecting relatively small sample size. All three haplogroups are of European descent (Torroni et al., 1996) and fall into previously reported Norwegian mitochondrial DNA variation (Dupuy and Olaisen, 1996; Helgason et al., 2001; Opdal et al., 1998; Passarino et al., 2002).

Three individuals (5861, 5864A and 5864B; 33%), belonging to haplogroup H*, were carriers of DNA sequences identical to rCRS (revised Cambridge Reference Sequence) (Anderson et al., 1981; Andrews et al., 1999). The prevalence of the haplotype in present-day Europeans was estimated based on mtDNA fragment between positions 16,123–16,329 from 229 individuals from Denmark (Mikkelsen et al., 2010; Richards et al., 1996), 960 individuals from Iceland (Helgason et al., 2003, 2000; Richards et al., 1996), 234 individuals from England (Helgason et al., 2001; Richards et al., 1996) and 1122 individuals from Norway (Helgason et al., 2001; Krzewińska unpublished manuscript; Opdal et al., 1998; Passarino et al., 2002) and was found to be around 20%. In a small population like the one from Flakstad, one would, therefore, expect to identify two carriers of the sequence. The presence of three carriers inflates the observed frequency of the mtDNA motif and probably results from a stochastic sampling effect. Since all remaining individuals were carriers of different lineages, we suggest that the examined sample does not represent a maternally closely related population. In order to further investigate genetic diversity among the examined individuals, we have calculated several diversity measures as in Brinkmann et al. (1999). The probability of obtaining different haplotypes, while sampling two individuals from the same population, was calculated as a gene diversity (Nei, 1987), and was equal to 81.5% (dw_{min})(four in five) in the Flakstad sample. Therefore, the maximum matching probability (probability of obtaining the same haplotype while randomly sampling two individuals from Flakstad) was equal to 18.5% (mw_{max}). The lower bounds of this estimation was 8% (mw_{min}). Both estimates were higher than among ancient populations from Denmark, England and Iceland, as well as among modern Norwegians (Table 1). Match probabilities are influenced both by geographical range and population size. Therefore, reported comparisons between nine individuals from Flakstad and larger populations representing wide geographical locations can only serve as an approximation. Nevertheless, the analysis revealed that the lower bound for finding within population haplotype match in Flakstad (8%) was most similar to observations from most closely related populations from ancient Iceland (5%) and modern Norway (6%). Seeing that individuals from a small localized population, such as Flakstad, would be expected to share some kinship, the observed values, even if approximated, suggest the examined individuals do not represent a particularly maternally inbred population.

4. Discussion and conclusions

The poor contextual information available at Flakstad was supplemented by the bioarchaeological analyses, strengthening both interpretation of multiple burials and differential treatment of individuals in multiple burials as intentional and not just an effect of taphonomic processes. Stable isotope analyses were used to argue that crania and postcranial bones were correctly matched, an inference that rendered possible further investigation of diet diversity. The probable decapitation and removal of heads indicated the presence of people from different social strata – something which is further emphasized by differences in stable isotope signatures of individuals buried intact compared to those lacking crania.

With the exception of burial no 5864, ancient DNA results support this interpretation, suggesting maternal relations between individuals buried together to be unlikely. The low haplotype diversity and relatively high probability of finding matching haplotypes in the sample from Flakstad (Table 1) cannot exclude possible maternal kinship between three individuals sharing the rCRS sequence. However, the shared haplotype is the most common European lineage and minimum match probabilities in Flakstad resembled values observed in larger, closely related ancient and modern populations. Therefore, we suggest that the rCRS carriers from Flakstad were probably not maternally related, and that the seemingly high prevalence of the rCRS haplotype reflects a sampling effect in the small sample. In one case where two rCRS carriers were buried together (5864), isotopic values revealed significantly different diets for the two individuals suggesting different social standing. Social inequality implies that these individuals did not have close family relations, or at least did not share meals. Ancient DNA results presented here can only reflect direct matrilineal kinship and cannot be used to exclude other numerous kinship relations between individuals. However, in light of isotope data suggesting significantly different dietary life histories in individuals buried together, it seems unlikely the individuals were closely related.

The Flakstad burials offer an unusual insight into the way of living in a hierarchical society. It is worth noting that isotopic values of headless individuals do not differ from the values of those buried in single burials. In a society where most of the daily activities were dedicated to the acquirement and preparation of food, where food shortage and harsh winters are assumed to have been a constant threat (Sigurdsson, 2008), it would seem likely that a different diet should be detectable in people of low social standing compared to the common population. However, isotopic data in this study show quite the contrary. Despite indications that the headless people in multiple graves might represent low-status members of the population, their diet was equivalent to those buried in single burials. The persons in single burials were all buried in a seemingly respectful way and accompanied by grave gifts, and are interpreted as representatives of the free population. They all had a diet combining marine and terrestrial sources, and a significant part of their diet consisted of marine foodstuffs – as did that of the headless individuals. It is of course possible that there might have been other dietary differences between social groups, through preparation and possibly the amount of protein, rather than different food sources. The complete individuals from multiple burials, however, stand out as a distinct group and may be perceived as persons of a special social status, emphasized by their distinctly different diet already evident during childhood. The lack of high status artifacts in multiple burials – although uncertain due to agricultural disturbance – could indicate that the complete individuals were not necessarily wealthy, but special in another sense. An alternative explanation might be previous disturbance,

not just as a result of agriculture, but also the possible plunder and removal of precious objects. Either way, the individuals buried intact seem to have belonged to separate social strata, treated differently than others in death as well as in life. Due to the poor contextual information from the site these observations could not have been made without information hidden in the human remains.

To conclude, the multidisciplinary approach to the skeletal remains from Flakstad has revealed some intriguing patterns. Results from stable isotope analyses show that individuals in multiple burials most likely were intentionally placed in the same burial, given the pattern in which the only person buried intact in each burial, had distinct isotope values. Thus, persons sharing a grave had distinctly different diets during their lifetime and were unlikely to share maternal kinship. A reasonable explanation for these observations could be that persons buried headless may have been slaves accompanying their masters in the grave. This interpretation corresponds well with other double burials from the Norse World with similar features, where decapitated and sometimes headless people were deposited as grave gifts. The resemblance in diet between headless persons and individuals buried in single burials was unexpected and calls for further investigation in the future. The present study indicates that also other double burials should be investigated using a bioarchaeological approach. This material offers an exceptional opportunity to study the subpopulation groups of the Norse, and their way of living in a divided and hierarchical world.

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